CLAIMS

1.   A fluid ejection device comprising:

a first set of N memory elements each storing a fire enable value, each of the N memory elements configured to be updated; and

N fluid ejecting elements, each fluid ejecting element corresponding to a different one of the N memory elements and configured to receive the fire enable value from the corresponding memory element, wherein the fluid ejecting element is enabled to eject a fluid when the fire enable value is an enabling value.

2.   The fluid ejection device of claim 1, wherein the first set of N memory elements and each of the N fluid ejecting elements are formed on a thin-flim structure formed on a substrate including a non-conductive material selected from a group consisting of an oxide formed on a metal, a carbon composite material, a ceramic material, and glass.

3.   The fluid ejection device of claim 1, wherein the N fluid ejecting elements are configured as a row that extends substantially for a width of a page of print media.

4.   The fluid ejection device of claim 1, further comprising:

a second set of N memory elements, each memory element storing a different one of N sub-blocks of an image data block, wherein each sub-block of image data includes an enabling value and a disabling value.

5.   The fluid ejection device of claim 4, wherein the image data block comprises a row of image data and each sub-block comprises a bit of image data.

6.   The fluid ejection device of claim 5, further comprising:

a third set of N memory elements, each memory element storing a different one of N sub-blocks of an image data block, wherein each sub-block of image data includes an enabling value and a disabling value.

7. The fluid ejection device of claim 6, wherein the first, second, and third sets of N memory elements each comprise a shift register having N memory elements.

8. The fluid ejection device of claim 6, wherein each of the N memory elements of the second set of N memory elements corresponds to a different one of the N memory elements of the third set of N memory elements, and wherein the second set of N memory elements is configured to receive the image data block from the third set of N memory elements in response to a load enable signal.

9. The fluid ejection device of claim 6, wherein after the second set of N memory elements receives the third set of N memory elements is configured to serially receive and store N sub-blocks of a next image data block.

10. The fluid ejection device of claim 4, wherein the each of the N fluid ejecting elements corresponds to a different one of the N memory elements of the second set of N memory elements and is configured to receive upon each cycle of the clock the image data sub-block from the corresponding memory element, wherein the fluid ejecting element generates an ink droplet when the fire enable value is the enabling value and when the image data sub-block is the enabling value.

11. The fluid ejection device of claim 10, wherein the fluid ejecting element does not generate an ink droplet when one of the fire enable value or the image data sub-block is the disabling value.

12.   The fluid ejection device of claim 10, wherein the N fluid ejecting elements are configured to print a block of image data in a print cycle, and wherein the first set of N memory elements is configured to serially receive in the print cycle a series of fire enable values representative of a fire enable pulse, wherein the first set of N memory elements receives a fire enable value upon each cycle of the clock, with a first fire enable value of the series being received upon a first clock cycle of the print cycle and a last fire enable value of the series being received upon a last clock cycle of the print cycle.

13.   The fluid ejection device of claim 12, wherein a first X fire enable values of the series received during a first X clock cycles of the print cycle are enablingvalues and a remaining N fire enable values of the series received during a remaining N clock cycles of the print cycle are disabling values such that the enabling values propagate through the first set of N memory elements in a print cycle, wherein at an end of the print cycle each of the N memory elements of the first set of N memory elements is storing the disabling value.

14.   The fluid ejection device of claim 13, wherein a product of X multiplied by a duration of the clock cycle substantially equals an enable pulse duration.

15   The fluid ejection device of claim 4, wherein each of the N fluid ejecting elements comprises:

a logic element configured to receive a fire enable value from the corresponding fire enable shift register memory element and to receive an image data sub-block from the corresponding memory element of the hold shift register, and to provide a power switch control signal having a first state when the fire enable value and the image data sub-block each are the enabling value;

a heater resistor having a first terminal connectable to a power source and a second terminal;

a switch coupled between the second heater resistor terminal and ground and receiving the switch control signal at control, and configured to connect the

second terminal of the heater resistor to ground when the switch control signal has the first state.

16.   The fluid ejection device of claim 15, wherein the switch comprises:

a field effect transistor having a gate coupled to the logic element, a drain coupled to the second terminal of the heater resistor, and a source coupled to ground.

17.   The fluid ejection device of claim 15, wherein the logic element comprises:

an AND-gate having a first input coupled to the corresponding memory element of the fire enable shift register, a second input coupled to the corresponding memory element of the data hold shift register, and an output providing the power switch control signal.

18.   A fluid ejection device comprising:

a series of N memory elements configured to serially receive a series values including at least one enabling value and to serially transfer the series of values through the series of N memory elements; and

N fluid ejecting elements, each fluid ejecting element coupled to a different one of the N memory elements and configured to receive the value from the corresponding memory element, wherein each fluid ejecting element is enabled to eject a fluid when the corresponding value has the at least one enable state.

19.   The fluid ejection device of claim 18, wherein the series of N memory elements and each of the N fluid ejecting elements are formed on a thin-film structure formed on a substrate including a non-conductive material selected from a group consisting of an oxide formed on a metal, a carbon composite material, a ceramic material, and glass.

20.   The fluid ejection device of claim 18, further comprising:

a first set of N memory elements, each memory element of the first set storing one bit of image data of a row of image data, wherein each bit of image data is one of an enabling value or a disabling value.

21. The fluid ejection device of claim 20, further comprising:

a second set of N memory elements, each memory element storing one bit of image data of a row of image data, wherein each bit of image data is one of the enabling value or the disabling value.

22. The fluid ejection device of claim 21, wherein the set of N memory elements and the first and second set of N memory elements each comprise a shift register having N memory elements.

23. The fluid ejection device of claim 21, wherein each of the N memory elements of the first set of N memory elements corresponds to a different one of the N memory elements of the second set of N memory elements, wherein the first set of N memory elements is configured to receive a present row of image data from the second set of N memory elements in response to a load enable signal, and wherein the second set of N memory elements is configured to serially receive a next row of image data after providing the present row of image data to the first set of N memory elements.

24. The fluid ejection device of claim 23, wherein each of the N fluid ejecting elements corresponds to a different one of the N memory elements of the first set of N memory elements and is configured to receive upon each cycle of a clock the image data bit from the corresponding memory element, wherein the fluid ejecting element is configured to eject an ink droplet when the fire enable value is the enabling value and when the image data bit is the enabling value, and wherein the fluid ejecting element does not eject an ink droplet when either the fire enable value or the image data bit is the disabling value.

25.   The fluid ejection device of claim 24, wherein the N fluid ejecting elements are configured to print a row of image data in a print cycle.

26.   The fluid ejection device of claim 25, wherein the series of N memory elements is configured to serially receive during the print cycle a fire enable pulse comprising a series of fire enable values, wherein the series of N memory elements receives one fire enable value of the series upon each cycle of the clock.

27.   A method of enabling N fluid ejecting elements of a fluid ejection device to generate an ink droplet, the method comprising:

storing a fire enable value in each of N memory elements of a fire enable shift register, wherein each memory element corresponds to a different one of the N fluid ejecting elements, each fire enable value being one of an enabling value or a disabling value;

updating the fire enable value in each of the N memory elements of the fire enable shift register from a fire enable value from an adjacent memory element upon each cycle of a clock;

providing upon each cycle of the clock to each of the N fluid ejecting elements the fire enable value from the corresponding memory element for the fire enable shift register, wherein the fluid ejecting element is enabled to generate an ink drop when the fire enable value has the enable sate.

28.   The method of claim 27, further comprising:

storing an image data value in each of N memory elements of an image data shift register, wherein each memory element corresponds to a different one of the N fluid ejecting elements, each image data value being one of an enabling value or a disabling value.

29.   The method of claim 28, further comprising:

providing upon each cycle of the clock to each of the N fluid ejecting elements the image data value from the corresponding memory element,

wherein the fluid ejecting element is configured to generate an ink drop when the fire enable value and the image data value are both enabling values.

30.   The method of claim 27, further comprising:

receiving serially in a print cycle at the fire enable shift register a series of fire enable values representative of a fire enable pulse, wherein the fire enable shift register receives a fire enable value upon each clock cycle of the print cycle with a first enable value of the series being received upon a first clock cycle of the print cycle and a last fire enable value of the series being received upon a last clock cycle of the print cycle.

31.   The method of claim 30, further comprising:

receiving a first X fire enable values of the series being enabling values during a first X clock cycles of the print cycle and a remaining N enable values of the series having the disable state during a remaining N clock cycle of the print cycle such that the first X fire enable values being enabling values propagate through the N memory elements of the fire enable shift register in a print cycle thereby sequentially enabling each of the N fluid ejecting elements to generate an ink droplet for a duration substantially equal to a product of X multiplied by a duration of a clock cycle.

32.   A fluid ejecting element for a fluid ejection device, the fluid ejecting element comprising:

an logic gate having a first input terminal connectable to a corresponding memory element of a fire enable shift register; a second input terminal connectable to a corresponding memory element of a data hold shift register; and having an output terminal;

a heating element having first terminal connectable to a power source, and a second terminal; and

a switch coupled between the second terminal and ground, and having a control gate coupled to the output terminal.

33.   The fluid ejecting element of claim 32, wherein the logic gate comprises and AND-gate.

34.   The fluid ejecting element of claim 32, wherein the heating element comprises a resistor.

35.   The fluid ejecting element of claim 32, wherein the switch comprises a field effect transistor having a gate coupled to the output terminal.

36.   A fluid ejection device comprising:

N fluid ejecting elements;

means for storing N fire enable values each corresponding to a different one of the N fluid ejecting elements and each being one of an enabling value or a disabling value; and

means for serially transferring each of the N fire enable values upon each cycle of a clock and for providing to each of the N fluid ejecting elements upon each cycle of the clock the corresponding fire enable value from the storage means, wherein the fluid ejecting element is enabled to generate an ink drop when the fire enable value is an enabling value.

37.   The fluid ejection device of claim 36, further comprising:

means for storing N image data values each corresponding to a different one of the N fluid ejecting elements and each being one of an enabling value or a disabling value.

38.   A fluid ejection device comprising:

N fire enable memory elements arranged into a plurality of zones, each memory element storing a fire enable value being an enabling value;

a fire enable controller configured to individually control for each memory element zone a duration of how long each memory element stores the enabling value; and

N fluid ejecting elements, each fluid ejecting element corresponding to a different one of the N memory elements and configured to receive the fire enable value from the corresponding memory element, wherein the fluid ejecting element is enabled to eject fluid when the fire enable value is the enabling value.

39.   A fluid ejection device comprising:

a plurality memory element sets, each set having a plurality of memory elements such that a sum of the memory elements of the plurality of memory element sets equals N, with each memory element capable of storing an enabling value;

N fluid ejecting elements, each fluid ejecting element corresponding to a different one of the N memory elements and configured to receive the value from the corresponding memory element, wherein the fluid ejecting element is enabled to eject fluid when the value is the enabling value; and

a fire enable controller individually controlling a duration that the enabling value is stored in the memory elements of each memory element set;

40.   A fluid ejection device comprising:

a first set of N memory elements, each memory element configured to store a series of first values;

a second set of N memory elements, each memory element configured to store a series of second values;

N combiners, each having a first input coupled to a corresponding one of the memory elements of the first set of N memory elements, a second input coupled to a corresponding one of the memory elements of the second set of N memory elements, and configured to provide a series of combined values including at least one enabling value based on the first and second values stored in the corresponding memory elements of the first and second set of N memory elements; and

N fluid ejecting elements, each corresponding to and configured to receive the series of combined values from a corresponding one of the N

combiners and enabled to eject fluid when the combined value is the enabling value

41.   A method of operating a fluid ejection device having a plurality of fluid ejecting elements, wherein N of the plurality of fluid ejecting elements into a plurality of zones with each zone having at least one fluid ejecting element, the method comprising:

storing a value being one of an enabling value or a disabling value in each of N memory elements, each memory element corresponding to a different one of the N fluid ejecting elements; and

enabling each fluid ejecting element to eject fluid when the value stored in the corresponding memory element is an enabling value; and

controlling individually for each zone a duration that an enabling value is stored in each corresponding memory element of the zone.

42.   A fluid ejection device comprising:

N fire enable memory elements arranged into a plurality of memory element zones, each memory element storing a value being one of an enabling value or a disabling value;

means for individually controlling a duration of the at least one enable state for each memory element zone; and

means for providing a value from each of the N memory elements to a corresponding different one of N fluid ejecting elements, wherein each fluid ejecting element is enabled to eject a fluid when the fire enable value is the enabling value.

43.   A fluid ejection device comprising:

a shift register having a first set of memory elements, each memory element storing a first enable value being one of an enabling value or a disabling value; and

a plurality of drop ejecting elements, each drop ejecting element corresponding to and configured to receive the first enable value from a different

one of the plurality of memory elements and each configured to receive a
corresponding second enable value having an enable state, each drop ejecting
element having a heating circuit configured to:

> operate in a first mode to generate heat sufficient to cause the
> corresponding drop ejecting element to eject fluid; and

> operate in a second mode to generate heat sufficient to warm the
> corresponding drop ejecting element, but insufficient to cause fluid to be
> ejected, based on the corresponding first and second enable values.